Unit 6: Quadratic Review

Factoring and Solving Methods

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Name: _____ Date: _____

GCF Factoring

Introduction to Factoring out GCF

★"Factor" simply means to **UN**DISTRIBUTE.★

Distributed Version	Factored Version
	$5x(x+3)$
	$2x^2(x-4)$
$2x^2-4x$	
$15x^2-5x+30$	

More formal Definition:

- ◎ ***Factoring:*** *Writing the polynomial as a product.*

Steps to Factoring Out a GCF:

- ★ Find the GCF of all its terms (number and/or variables). For variables ALL the terms must have the variable. *Choose the <u>smallest</u> exponent!*
- ★ The GCF goes to the LEFT!
- ★ Write the polynomial as a product by *<u>dividing</u>* the original terms of the polynomial by the GCF.
- ★ The remaining factors in each term will form a polynomial. You'll always have the same number of terms you started with.

Factor using a GCF:

◎ $4x+6y$

◎ $6x^3-9x^2+12x$

◎ $y^8-y^5+y^2$

GCF Factoring

Greatest Common Factor: The largest number that divides evenly into a set of numbers.

When dealing with variables, it is the lowest degree of a variable common to every term.

Examples: Factor the GCF of each of the following:

1. $(8xy - 2y)$	2. $(27x^3 - 9x^2)$	3. $(42xy^5 + 7x^2)$	4. $(2x^2 - 12x)$

To factor the GCF out of an expression, divide each term by the GCF and write your answer in un-distributed form.

Factor the GCF out of each of the following:

5. $10x^3 - 5x$	6. $y^5 + y^2$	7. $27x - 81xy^2$	8. $10x - 14y + 40x^2$
9. $x^3y - x^5yz^3 + x^2y^2$	10. $17z^2 - 68zy^2$	11. $2x - 16y$	12. $5y + 20y^2 - 125$

PRACTICE: Factor each polynomial using a GCF.

1. $10x + 45$

2. $28x - 63$

3. $18a + 42$

4. $8x + 24$

5. $18x^2 - 15x + 39$

6. $27a^2 + 81$

7. $72a^8 + 33a^5 - 42a^3$

8. $15x^7 + 30x^6 - 45x^3$

9. $4x^3 + 16x^2 - 44$

10. $14x^2 + 7x - 42$

Factor GCF of a Polynomial **Name:** _____

Practice Assignment **Date:** _____ **Block:** _____

Review: Multiply the polynomials

a. $(x + 4)(x - 3)$ b. $(x + 8)^2$ c. $(2x + 4)(5x - 1)$

Factor the following polynomials.

1. $x^2 + 10x$ 2. $x^2 - 9x$ 3. $x^2 - 6x$

4. $3b^2 - 81b$ 5. $10x^2 + 40x$ 6. $8x^2 + 24x$

10. $-2x^2 - 4x$ 11. $-30x^2 + 25x$ 12. $-28x^2 - 14x$

When you factor an expression, you break each term down into its prime factors and expand the variables. The GCF of the terms goes on the outside of the expression and what is leftover goes in parenthesis after the GCF.

Practice: Factor each expression.

1. $x^2 + 5x$

2. $x^2 - 8x$

3. $x^2 - 3x$

4. $28x - 63$

5. $18x^2 - 6x$

6. $4x^2 - 4x$

7. $2m^2 - 8m$

8. $-9a^2 - a$

9. $35y^2 - 5y$

10. $6x^3 - 9x^2 + 12x$

11. $4x^3 + 6x^2 - 8x$

12. $15x^3y^2 + 10x^2y^4$

Factor by Grouping

Use grouping when you have.....

$$ax^3 + bx^2 + cx + d$$

Four terms! Check for a GCF first.

Steps:

1. Group the first two terms and the last two terms.

2. Factor the GCF from each group.

It should look like: GCF(leftovers)+/-GCF(leftovers)

*For the second group, if the third term is negative make your gcf negative.

* You GCF may be 1 or -1 :)

* Your leftovers should be matching!

3. Your final factors will be (GCF +/- GCF)(Leftovers)

Examples

1. $4x^3 - 12x^2 - 5x + 15$

2. $3x^3 + 9x^2 + x + 3$

3. $x^3 + 7x^2 - 8x - 56$

4. $3x^3 - 18x^2 - 8x + 48$

5. $21x^3 + 147x^2 - 18x - 126$

6. $15x^3 - 10x^2 + 9x - 6$

7. $2x^3 - 5x^2 + 12x - 30$

Geometry Name_____ ID: 1

Factor by Grouping Practice

Date_____ Period____

Factor each completely.

1) $8r^3 - 4r^2 + 6r - 3$

2) $2p^3 + 3p^2 + 4p + 6$

3) $12x^3 - 3x^2 - 8x + 2$

4) $12x^3 + 20x^2 - 15x - 25$

5) $4x^3 - 12x^2 - 3x + 9$

6) $10k^3 - 4k^2 - 25k + 10$

7) $4m^3 + m^2 - 20m - 5$

8) $2p^3 + p^2 - 4p - 2$

9) $20n^3 + 5n^2 + 4n + 1$

10) $4p^3 + p^2 + 20p + 5$

11) $448m^3 + 280m^2 + 128m + 80$

12) $8m^3 - 48m^2 + 5m - 30$

13) $96r^3 + 12r^2 - 32r - 4$

14) $24x^3 + 6x^2 + 144x + 36$

15) $7k^3 + 42k^2 + 5k + 30$

16) $12n^3 - 15n^2 + 32n - 40$

17) $5x^3 - 25x^2 - 4x + 20$

18) $6p^3 + 8p^2 - 30p - 40$

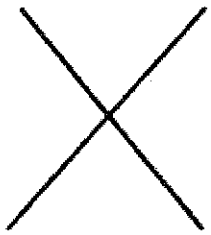
19) $32r^3 + 8r^2 - 4r - 1$

20) $35b^3 + 25b^2 - 42b - 30$

Factoring Trinomials by Grouping when a = 1

Make sure it's in standard form:	**Ask the question:**
When C is positive:	**When C is negative:**
1. $x^2 + 5x + 6$	2. $x^2 - 5x - 6$
3. $x^2 + 11x + 24$	4. $x^2 + 5x - 24$
5. $x^2 - 13x + 36$	6. $x^2 - 4x - 12$
7. $x^2 - 15x + 36$	8. $x^2 + 4x - 21$
9. $2x^2 + 12x + 16$	10. $3x^2 - 9x - 120$

Factor Trinomials With the Grouping Method

Factor $x^2 + 5x - 50$	
1. Factor any GCF's out of the trinomial prior to starting the grouping method. Multiply *a* and *c*. Find two factors of *ac* that add up to *b*.	
2. Split the middle term into two terms using the factors from step 1.	
3. Group the first two terms together with parenthesis and group the last two terms together with parenthesis. There should be a plus sign between them.	
4. Factor out the common (GCF of each set of parentheses. The terms left inside the parenthesis should match! Now, re group!	

Practice: Factor the following trinomials.

a. $x^2 - 12x + 20$

b. $x^2 - x - 30$

c. $x^2 + 6x - 7$

d. $x^2 + 9x + 20$

Practice: Factoring A = 1

a. $x^2 + 4x - 32$

b. $x^2 + 5x + 6$

c. $x^2 + 11x + 18$

d. $x^2 - 13x + 40$

e. $x^2 - 3x - 18$

f. $x^2 - 14x + 48$

g. $x^2 - 5x - 24$

h. $x^2 - 10x + 25$

i. $x^2 - 36$

j. $x^2 + 10x + 50$

Factor Trinomials with a GCF first!

Always check for a GCF when the a value of your trinomial is a number other than 1.

a. $2x^2 + 16x + 24$

b. $4x^2 + 24x + 20$

c. $3x^2 + 12x + 9$

d. $4x^3 + 12x^2 + 8x$

e. $2x^3 + 14x^2 + 20x$

f. $5x^3 - 125x$

Name: _____ Date: _____

Factoring Trinomials: $ax^2 + bx + c$ OR $ax^2 - bx + c$

UNIT QUESTION: In what ways can algebraic methods be used in problems solving?

Factor each trinomial:

1. $x^2 + 7x + 6$

2. $x^2 + 9x + 14$

3. $x^2 - 6x + 8$

4. $x^2 - 10x + 16$

5. $2x^2 - 16x + 24$

6. $3x^2 + 36x + 60$

7. $4x^2 + 24x + 32$

8. $x^2 + 15x + 14$

9. $x^2 + 5x + 4$

10. $x^2 + 9x + 20$

11. $x^2 - 12x + 20$

12. $x^2 - 13x + 40$

13. $x^2 + 15x + 36$

Factoring Trinomials: $ax^2 + bx - c$ OR $ax^2 - bx - c$

Factor each polynomial completely:

14. $x^2 + 2x - 48$

15. $x^2 + 8x - 20$

16. $x^2 - 4x - 21$

17. $x^2 - 9x - 36$

18. $x^2 + 2x - 8$

19. $x^2 - 5x - 14$

20. $x^2 - 5x - 24$

21. $x^2 + 5x - 14$

22. $x^2 + x - 20$

23. $x^2 - 5x - 66$

24. $x^2 - 3x - 40$

25. $x^2 + 11x + 18$

Name _____ Date_____

Factoring Trinomials – Last Term Positive

Today's Question: How do we factor trinomials? (Standard: MM1A1f)

Factor each trinomial completely and check your answer by using multiplication

1. x^2+6x+8	**Check**
2. x^2-6x+5	**Check**
3. $x^2+10x+24$	**Check**
4. $x^2-10x+9$	**Check**
5. x^2+8x+7	**Check**
6. $x^2-7x+10$	**Check**
7. $x^2+10x+25$	**Check**

Factoring Trinomials – Last Term Negative

Factor each polynomial completely:

8. $x^2 + 2x - 8$ | **Check**

9. $x^2 - 2x - 24$ | **Check**

10. $x^2 + x - 20$ | **Check**

11. $x^2 - 3x - 40$ | **Check**

12. $x^2 - 10x - 24$ | **Check**

13. $x^2 + 2x - 8$ | **Check**

14. $x^2 - 6x - 16$ | **Check**

Special Cases Factoring Notes and Examples

What is a Perfect Square?	**Can Variables be Perfect Squares?**
Remember FOIL? (Multiply out 1-4) 1. $(x+8)(x+8)$	**2)** $(x+5)(x+5)$
3) $(x+8)(x-8)$	**4)** $(x-5)(x+5)$
What's happening in #1 and #2?	**Perfect Square Trinomials**

What's happening in #3 and #4	Difference of Squares Factoring
5) $(x^2 - 9)$	**6)** $(x^2 - 49)$
7) Always Check for a GCF First $(2x^2 - 32)$	**8)** $(4x^2 - 36)$
8) $(x^2 - 1)$	**9)** $(4x^2 - 64y^2)$

Factor each using Difference of Two Squares. Always check for a GCF First.

1) $3v^2 - 12$

2) $36x^2 - 100$

3) $100n^2 - 16$

4) $16n^2 - 36$

5) $45v^2 - 5$

6) $25a^2 - 1$

7) $b^2 - 9$

8) $27x^2 - 75$

Name:_____ Date:_____

Difference of Two Squares Practice

1. $x^2 - 16$	2. $36x^2 - 121$
3. $25x^2 - 16$	4. $4x^2 - 81y^2$
5. $x^2 - 25$	6. $x^2 - 121$
7. $x^2 - 81$	8. $3x^2 - 48$
9. $4x^2 - 49$	10. $36x^2 - 1$
11. $x^2 - 64$	12. $x^2 - 9$
13. $x^2 - y^2$	14. $9x^2 - 121$
15. $x^2 - 4$	16. $x^2 - 25$
17. $4x^2 - 81$	18. $2x^2 - 50$

Factoring Trinomials when a > 1

<u>Lets think about grouping...</u>

1) $6x^2+4x+15x+10$	2) $3x^2-18x+4x-24$
3) $7x^2+35x+3x+15$	4) $6x^2-16x+27x-72$

<u>Steps:</u>

1. Make sure the trinomial is in Standard Form
2. Multiply A times C.
3. Find the numbers that multiply to be (AC) but add to be B.
4. Break the B value into those numbers.
5. Factor by grouping.

1. $2x^2+23x+30$	2. $3x^2+14x-80$
3. $7x^2-38x+40$	4. $3x^2-x-4$

5. $5x^2+54x+40$	6. $7x^2-46x-21$
7. $10x^2+49x+18$	8. $6x^2+31x+35$
9. $8x^2+30x+27$	10. $9x^2-35x+24$
11. $4x^2-21x-18$	12. $4x^2-15x-4$

Name:_____ Date:_____

Factoring (a>1)

Factor the following:

1) $3x^2 - 2x - 5$

2) $3x^2 - 8x + 4$

3) $2x^2 + 11x + 5$

4) $7n^2 + 53n + 28$

5) $5x^2 + 8x - 4$

6) $5x^2 + 18x - 8$

7) $3x^2 + 5x - 2$

8) $2x^2 + 13x + 15$

9) $15n^2 - 27n - 6$

10) $16x^2 + 60x - 100$

11) $6x^2 + 7x - 49$

12) $15p^2 - 31p + 10$

Name: _____ Date: _____

Factoring Maze

Instructions: Start at the top left hand corner, and solve the maze by factoring every trinomial you come across. Write the factors under the trinomial. You can only move one square up, down, left, or right when it SHARES one common factor with the current square. You have solved the maze when you exit at the bottom right.

START $6x^2 + x - 1$	$2x^2 - 7x - 4$	$3x^2 - 7x - 20$	$2x^2 + 15x + 7$	$7x^2 + 50x + 7$	$11x^2 - 14x + 3$
$3x^2 - 17x + 10$	$6x^2 + 35x + 11$	$6x^2 + 19x + 15$	$3x^2 - 17x + 20$	$16x^2 + 26x + 9$	$15x^2 - 26x + 11$
$8x^2 + 30x + 13$	$4x^2 + 7x - 2$	$8x^2 + 10x - 3$	$2x^2 + 35x + 17$	$7x^2 - 30x + 27$	$8x^2 + 18x + 9$
$2x^2 - 3x - 2$	$3x^2 + x - 10$	$6x^2 - 23x + 7$	$2x^2 - 5x + 2$	$7x^2 - 26x - 8$	$5x^2 - 14x - 3$
$6x^2 + 7x - 3$	$2x^2 + 7x + 6$	$2x^2 - 5x + 3$	$20x^2 - 31x - 9$	$20x^2 + 17x + 3$	$3x^2 - 7x - 6$
$3x^2 - 13x + 4$	$2x^2 - x - 3$	$8x^2 - 10x - 3$	$2x^2 - 11x - 21$	$7x^2 - 20x - 3$	$13x^2 - 8x - 5$
$2x^2 - 3x - 20$	$4x^2 + 12x + 5$	$2x^2 - 5x - 3$	$3x^2 - 10x + 3$	$5x^2 - 12x - 7$	$10x^2 + 11x - 8$
$12x^2 - x - 20$	$14x^2 + 23x - 15$	$2x^2 + x - 6$	$4x^2 - 11x - 3$	$4x^2 + 5x + 1$	$3x^2 + 5x + 2$ **FINISH**

Factoring Review Name:_____

1. Factor out the GCF: $7x^2 + 14x + 28$	2. Factor out the GCF: $5a^2b^2 + 25ab^2$
3. Factor: $x^2 + 2x - 15$	4. Factor: $x^2 + 15x + 26$
5. Factor: $x^2 - 10x + 24$	6. Factor: $a^2 - 7a - 30$
7. Factor: $x^2 + 3x - 40$	8. Factor: $x^2 - 16$
9. Factor: $9x^2 - 49$	10. Factor: $x^2 + 18x + 81$

Factoring Review Name:_____

11. Factor: $16x^2 - 40x + 25$	12. Factor: $2x^2 + 5x + 3$
13. Factor: $4x^2 - 17x + 18$	14. Factor: $t^2 + 16t + 64$
15. Factor: $9x^2 + 15x + 4$	16. Factor completely: $15x^2 - 10x - 25$
17. Factor completely: $8x^2 - 18$	18. Factor completely: $60x^3 + 54x^2 - 6x$

SOLVE BY FACTORING NOTES

Zero Product Property tells us that if the product of two factors is zero, then one of them must equal zero. To solve by factoring, we set the equation equal to zero, factor it, and then find out what makes each of the factors equal zero. Here are some examples that are already factored and set equal to zero.

So, if we have the factors: $(x+3)(x-2)=0$

- We can set each one equal to zero to find out what makes the whole equation equal zero.

$(x+3)=0 \quad x-2=0$

$x=-3 \quad x=2$

- Our solutions are x = -3, and x = 2. Plugging either one of these in for x will make the whole thing equal zero.

1. $(x+5)(x+3)=0$ 2. $(x-2)(2x+7)=0$ 3. $(2x+3)(3x-2)=0$ 4. $x(x-7)=0$

Type 1: GCF Factoring: Two Terms or Three terms

- Always Check for a GCF first.
- If you have only two terms, it is either GCF of Difference of Squares.
- Use the Zero Product Property to Solve
- Get the equation in standard form, set equal to zero.

Let's take a look:

5. $x^2-3x=0$

You try!

6. $2x^2-10x=0$

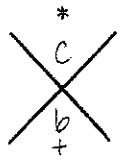
Let's take a look:

7. $6x^2=12x$

You try!

8. $-4x^2=-24x$

Type 2: Solve by Trinomial Factoring When a=1



- Remember Standard Form: $ax^2+bx+c=0$ (must have 3 terms)
- Look for the numbers that multiply to be "c" but add to be "b"

9. $x^2+6x+8=0$

10. $x^2-x=20$

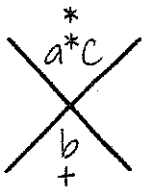
You Try:

Always check for a GCF First!

11. $x^2 - 8x + 15 = 0$

12. $2x^2 + 22x = -48$

Type 3: Solve by Trinomial Factoring When a > 1



- Remember Standard Form: $ax^2 + bx + c = 0$
- Must have 3 terms.
- Always Check for a GCF First
- Look for the numbers that multiply to be "a*c" but add to be "b"
- Factor by grouping!
- Set each factor equal to zero and solve.

13. $5x^2 + 12x - 9 = 0$

14. $4x^2 - 29x + 7 = 0$

Special case: Difference of Squares

- **Two terms!** Always check for a GCF First!
- Must be subtraction!
- First and last terms must be perfect squares

15. $x^2 - 9 = 0$

16. $2x^2 - 50 = 0$

Practice: Solving Quadratics by Factoring

Name_____

Steps:

1) Get the quadratic in standard form: $ax^2 + bx + c = 0$
2) Check for a GCF.
3) Continue factoring.
4) Set each factor equal to zero and solve each equation.

Solve the following by factoring.

1. $x^2 + 5x + 6 = 0$

2. $2x^2 - 10x - 12 = 0$

3. $x^2 = 3x$

4. $2x^2 + 12 = 11x$

5. $x^2 - 36 = 0$

6. $3x^2 - 8x = -2x$

7. $2x^2 + 32x = -128$

8. $3x^2 - 7x = 20$

9. $15x^2 = 7x + 2$

10. $6x^2 + 3x = 0$

Solve the quadratic equation below by factoring.

$$x^2 + 3x + 2 = 0$$

1

QUADRATIC EQUATIONS: SOLVE BY FACTORING METHOD

Solve the quadratic equation below by factoring.

$$x^2 + x - 6 = 0$$

2

QUADRATIC EQUATIONS: SOLVE BY FACTORING METHOD

Solve the quadratic equation below by factoring.

$$-2x^2 + 4x + 30 = 0$$

3

QUADRATIC EQUATIONS: SOLVE BY FACTORING METHOD

Solve the quadratic equation below by factoring.

$$3x^2 - 15x + 18 = 0$$

4

QUADRATIC EQUATIONS: SOLVE BY FACTORING METHOD

Solve the quadratic equation below by factoring.

$$3x^2 + 4x - 4 = 0$$

5

QUADRATIC EQUATIONS: SOLVE BY FACTORING METHOD

Solve the quadratic equation below by factoring.

$$2x^2 - 3x - 9 = 0$$

6

QUADRATIC EQUATIONS: SOLVE BY FACTORING METHOD

Solve the quadratic equation below by factoring.

$$5x^2 - 6x - 10 = -2$$

7

QUADRATIC EQUATIONS: SOLVE BY FACTORING METHOD

Solve the quadratic equation below by factoring.

$$3x^2 - 14x + 18 = 3$$

8

QUADRATIC EQUATIONS: SOLVE BY FACTORING METHOD

Solve the quadratic equation below by factoring.

$$x^2 + 3x + 13 = 3 - 4x$$

9 QUADRATIC EQUATIONS: SOLVE BY FACTORING METHOD

Solve the quadratic equation below by factoring.

$$-2x^2 + 12x + 15 = -3x^2 + 4x$$

10 QUADRATIC EQUATIONS: SOLVE BY FACTORING METHOD

Solve the quadratic equation below by factoring.

$$8x^2 - 18x - 5 = 3x^2 + 5x + 5$$

11 QUADRATIC EQUATIONS: SOLVE BY FACTORING METHOD

Solve the quadratic equation below by factoring.

$$8x^2 + 5 = 5x^2 + 14x - 3$$

12 QUADRATIC EQUATIONS: SOLVE BY FACTORING METHOD

Solve the quadratic equation below by factoring.

$$(x-2)^2-1=8$$

13

QUADRATIC EQUATIONS: SOLVE BY FACTORING METHOD

Solve the quadratic equation below by factoring.

$$3(x^2+1)-x=2x+9$$

14

QUADRATIC EQUATIONS: SOLVE BY FACTORING METHOD

Solve the quadratic equation below by factoring.

$$2(x^2+6)+5x=-9x-8$$

15

QUADRATIC EQUATIONS: SOLVE BY FACTORING METHOD

Solve the quadratic equation below by factoring.

$$2(x^2-2)+x=4x-5$$

16

QUADRATIC EQUATIONS: SOLVE BY FACTORING METHOD

Radicals Notes

$$\sqrt[\#]{radicand}$$

What is a perfect square?

1. Take the square Root.

a. $\sqrt{16}$ = _____

b. $\sqrt{25}$ = _____

c. $\sqrt{100}$ = _____

Find the largest perfect square that goes evenly into the radicand.

d. $\sqrt{32}$ = _____

e. $\sqrt{48}$ = _____

f. $\sqrt{80}$ = _____

2. $\sqrt{75}$

3. $\sqrt{20}$

4. $\sqrt{128}$

5. When there's a coefficient....

$6\sqrt{16}$

6. $-5\sqrt{12}$

7. $-8\sqrt{32}$

8. **When there's a variable....**

$\sqrt{150b^4}$

9. $\sqrt{216x^3}$

10. $\sqrt{18k^2}$

11. $\sqrt{8n^2}$

12. $\sqrt{63x}$

13. Putting it all together.

$3\sqrt{192x^4y^2}$

14. $2\sqrt{98y^5}$

15. $4\sqrt{45y^6}$

Name: _____ Date: _____

Simplifying Radicals - Classwork

RADICALS ARE IN SIMPLEST FORM:

- ☆ NO perfect square factors other than 1 are under the radical.
- ☆ NO fractions are under the radical
- ☆ NO radicals are in the denominator

List out the first 10 perfect squares:

Simplify:

1. $\sqrt{45}$	2. $-\sqrt{98}$	3. $\sqrt{48}$	4. $2\sqrt{45}$
5. $\sqrt{20}$	6. $4\sqrt{40}$	7. $-\sqrt{99}$	8. $\sqrt{108}$

SIMPLIFYING VARIABLES AS RADICALS:

- ☆ EVEN EXPONENTS – Take half of the exponent OUTSIDE the radical and leave NOTHING under the radical sign.
- ☆ ODD EXPONENTS – leave ONE exponent UNDER the radical and take HALF of the rest OUTSIDE the radical sign.

Simplify:

9. $\sqrt{x^6}$

10. $\sqrt{a^3b^4}$

11. $\sqrt{18c^5d^4}$

Practice:

1. $\sqrt{125}$

2. $\sqrt{200}$

3. $\sqrt{16x^2}$

4. $-2\sqrt{15x^2y^8}$

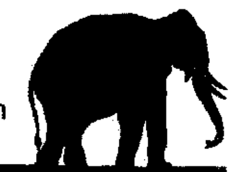
5. $\sqrt{450x^5}$

6. $\sqrt{196x^7y^4}$

7. $\sqrt{24x^2y^9}$

8. $3\sqrt{48y^{12}}$

Do Elephants Know How to Gamble?



Simplify each expression below. Assume that all variables represent nonnegative numbers. Find your answer in the corresponding set of answer boxes. Print the letter of the exercise in the box above the answer.

(T) $\sqrt{9x^2}$
(E) $-\sqrt{49x^2}$
(A) $\sqrt{4x^2y^2}$
(H) $\sqrt{12x^2}$
(O) $-\sqrt{45x^2}$
(T) $\sqrt{25y^4}$
(E) $-\sqrt{28x^4}$
(Y) $\sqrt{16xy^2}$
(V) $-\sqrt{20xy^2}$
(D) $\sqrt{7x^2y}$
(H) $\sqrt{9x^2y^4}$
(N) $\sqrt{24x^4y^2}$

$5y^2$	$2x\sqrt{3}$	$-7x$	$4y\sqrt{x}$	$2xy\sqrt{6y}$	$x\sqrt{7y}$	$-3x\sqrt{5}$	$2x^2y\sqrt{6}$	$3x$	$3x^2y^3$	$3xy^2$	$2xy$	$-2y\sqrt{5x}$	$-2x^2\sqrt{7}$	

(E) $\sqrt{a^3}$
(T) $-\sqrt{40a^3}$
(A) $\sqrt{54a^3b^2}$
(E) $\sqrt{75a^2b^3}$
(I) $\sqrt{144b^6}$
(E) $-\sqrt{1000a^6}$
(S) $\sqrt{18a^6b^2}$
(H) $\sqrt{15a^8b^3}$
(A) $\sqrt{a^5b^8}$
(V) $2\sqrt{50ab^5}$
(D) $8\sqrt{300a^4b^6}$
(G) $5\sqrt{98a^{20}b^3}$

$-2a\sqrt{10a}$	$a^4b\sqrt{15b}$	$-10a^3\sqrt{10}$	$40ab^3\sqrt{3}$	$10b^2\sqrt{2ab}$	$a\sqrt{a}$	$35a^{10}b\sqrt{2b}$	$3ab\sqrt{6a}$	$3a^3b\sqrt{2}$	$a^2b^2\sqrt{5}$	$12b^3$	$80a^2b^3\sqrt{3}$	$5ab\sqrt{3b}$	$a^2b^4\sqrt{a}$

Name: _____

Directions: Solve each of the following equations. **If there is no "bx" term in your quadratic, you can solve by the square root method!**

Steps:

1. **Isolate the squared term, or the binomial squared.**
2. **Take the square root of both sides. Use a +/- for the number you take the square root of.**
3. **Simplify the radical!**
4. **Unless it is a special case, you should have 2 answers.**

1. $x^2 = 64$

2. $x^2 = 96$

3. $x^2 - 9 = 16$

4. $x^2 - 1 = 80$

5. $4x^2 + 7 = 23$

6. $2x^2 + 3 = 93$

Now lets try it with binomials. Make sure you isolate the binomial!

7. $2(x-3)^2 = 8$

8. $5(x-4)^2 = 125$

9. $4(x+1)^2 = 100$

10. $(x-5)^2 - 100 = 0$

11. $5(x-1)^2 = 50$

12. $-3(x+2)^2 = -18$

13. $5(x-7)^2 = 135$

14. $8(x+4)^2 = 96$

15. $\frac{1}{4}(x-8)^2 = 7$

16. $(2x-5)^2 = 81$

17. $2(x-6)^2 - 45 = 53$

18. $5(x+4)^2 - 3 = 17$

Name: _____ Date: _____

Solving Quadratics by Using Square Roots

Solve each quadratic equation.

1. $x^2 + 4 = 29$	2. $3x^2 - 7 = 47$	3. $x^2 + 11 = 16$
4. $(x+4)^2 = 121$	5. $(2x-3)^2 = 9$	6. $(x-7)^2 = 99$
7. $(x+3)^2 + 6 = 18$	8. $(2x+6)^2 - 8 = 24$	9. $x^2 + 21 = 5$
10. $3(x+4)^2 = -9$	11. $3(x^2-4) = 2x^2 - 1$	12. $\frac{2}{5}x^2 - 3 = 7$
13. $x^2 - 14x + 13 = 0$	14. $2x^2 - 7x = x^2 - 12$	15. $2x^2 - 15 = -7x$

Solving By the Square Roots Method Practice

Name:_____

1. $5x^2 = 240$	2. $4x^2 = 52$
3. $x^2 + 5 = 167$	4. $2x^2 - 8 = 152$
5. $2x^2 + 5 = 19$	6. $(x - 3)^2 = 18$
7. $3(x - 4)^2 = 15$	8. $(5x + 1)^2 = 25$
9. $(3x - 4)^2 = 42$	10. $(5x - 1)^2 = 16$
11. $4(8x - 9)^2 = 24$	12. $5(7x + 5)^2 = 50$

Completing the Square: Intro

Name_____

Let's recall what it means to be a perfect square!

Trinomials can also be perfect squares! Factor these examples:

a. $x^2+8x+64$ b. x^2+6x+9 c. $x^2-12x+36$

Can we figure out what number should be the constant to make these perfect square trinomials? Then factor.

1. x^2+10x+____ 2. x^2-14x+____ 3. x^2-8x+____

4. x^2+2x+____ 5. x^2+13x+____ 6. x^2-7x+____

7. x^2+18x+____ 8. x^2+20x+____ 9. x^2+4x+____

Name: _____ Date: _____

Solving Quadratic Equations by Completing the Square

UNIT QUESTION: How are real life scenarios represented by quadratic functions?

Today's Question: When is it useful to solve quadratics by completing the square? MCC9-12.A.REI.4b

Solving Quadratic Equations by Completing the Square

1. Rewrite so all terms containing x are on one side.
2. Find the number that completes the square on the left side of the equation. Add that number to both sides,
3. Factor the perfect square trinomial on the left side of the equation. Simplify the right side of the equation.
4. Take the square root of each side.
5. Solve for x.
6. Check your answers!!!

Solve each equation.

1. $x^2 - 10x - 54 = 0$

2. $x^2 - 18x + 77 = 0$

3. $x^2 + 20x - 73 = 0$

4. $x^2 + 6x - 72 = -8$

5. $x^2 - 10x - 56 = 6$

6. $x^2 - 14x - 75 = 8$

Solve each equation.

1. $x^2 + 2x - 3 = 0$

2. $x^2 = 6x + 4$

3. $4x^2 + 32x + 16 = 0$

4. $3x^2 + 6x = 12$

Day 6 – Solving by Completing the Square **Name:** _____
Practice Assignment

Steps for Solving Quadratics by Completing the Square (works only when a = 1):
1. Move constant to the other side by adding or subtracting
2. Add $\left(\frac{b}{2}\right)^2$ to both sides
3. Factor the left side into a binomial squared.
4. Take the square roots of both sides.
5. Solve for x.

1. $x^2 - 16x - 8 = 0$

x = _____

2. $x^2 - 8x + 6 = 0$

x = _____

3. $x^2 - 12x + 10 = 0$

x = _____

4. $x^2 + 20x - 15 = 0$

x = _____

5. $x^2 + 14x + 5 = -5$

x = _____

6. $x^2 + 6x - 18 = -9$

x = _____

Defend:
Matt is trying to solve the following problem by completing the square:

$$x^2 - 18x + 6 = 0$$

He believes he has got the answer and wants to compare it with his classmate, Marcus. He says,"Hey Marcus, I got $x = 9 + 5\sqrt{3}$ and $9 - 5\sqrt{3}$, what did you get?"

Marcus replied, "hmm that's weird I got $x = 9 + \sqrt{75}$ and $9 - \sqrt{75}$."

Matt then says "well we both got the 9 part so we have similar thinking, lets ask Tiffany!"

Tiffany looks at their work and says " I got the same thing as Matt I just combined like terms and got $x = 14\sqrt{3}$ and $4\sqrt{3}$."

More confused than ever they call over Mrs. Dombrowski. She assures them that one of them has the correct answer...

Who is correct? Explain.

Error Analysis:
Describe and correct the error Emma made when attempting to solve by completing the square.
Problem: $x^2 + 20x - 8 = 0$

Emma's Process:
$x^2 + 20x - 8 = 0$
$x^2 + 20x + \_\_\_\_ = 8 + \_\_\_\_$
$x^2 + 20x + 10 = 8 + 10$
$x^2 + 20x + 10 = 18$

There are no numbers that multiply to 10 and
Add to 20. Therefore, it is not factorable.

Correct Process:

Name_____

The Quadratic Formula

The **Quadratic Formula** can be used to solve any quadratic equation in the form $ax^2+bx+c=0$.

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

Steps	Example 1: Solve $x^2 = 99 + 2x$
Step 1: Make the equation = 0	
Step 2: Identify a, b, and c, and substitute them into the quadratic formula.	
Step 3: Simplify...eliminate double signs, evaluate $b^2 - 4ac$ and multiply the denominator.	
Step 4: Simplify the $\sqrt{\ }$, don't forget ±!	
Step 5: Add and subtract – then divide to find two solutions.	

Example 2: Solve $6x^2 + 8x + 6 = 0$

Example 3: Solve $x^2 + x - 13 = 0$

Example 4: Solve $11x^2 + 12x - 18 = 0$

Example 5: Solve $4x^2 - 4x + 1 = 0$

The Discriminant

Notice that the number inside the radical determines the type of solutions we find. This number is called the **discriminant.**

$$\textbf{Discriminant} = b^2-4ac$$

THIS IS THE RADICAND OF THE QUADRATIC FORMULA. THE RADICAL SYMBOL IS NOT INCLUDED!

If the discriminant is **negative**, there will be **NO real solution.**

If the discriminant is **zero**, there will be **ONE unique real solution** (DOUBLE ROOT) .

If the discriminant is **positive**, there will be **TWO real solutions.**

Example 6: Calculate the discriminant for the quadratic equation. Then determine the number of real solutions.		Step 1: Make the equation = 0 Step 2: Determine a, b and c. Step 3: Substitute into b^2-4ac Step 4: Evaluate
a. $-x^2+3x-8=2$	b. $5x^2+10x+5=0$	c. $3x^2+2x-3=2$

Name: _____ Date: _____

Find the discriminant and use it to determine if the equation has *one real*, *two real*, or *two imaginary* roots.

1. $x^2+4x+3=0$
2. $x^2-2x+4=0$
3. $x^2-2x+1=0$
4. $3x^2+2x-1=0$
5. $-x^2-x=4$
6. $5x^2-4x+1=3x+4$

Use the quadratic formula to solve the equation (Exact answers only).

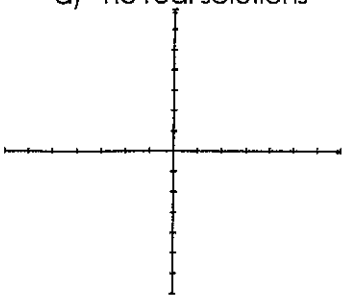
7. $x^2+4x-2=0$
8. $x^2+2x=4x$
9. $-x^2+1=-5x^2+4x$
10. $7x^2+6x+2=0$
11. $2x^2-3x+1=0$
12. $x^2+4x-1=0$
13. $x^2+4=0$
14. $2x^2-3x+2=0$
15. $2x^2+2x=4x-1$

Quadratic Formula
Practice Assignment

Name: _____

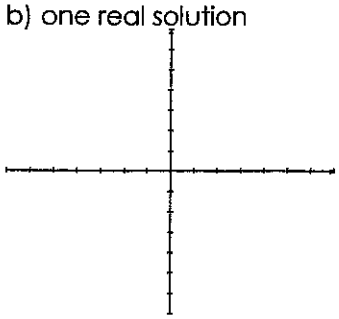
1. Sketch a quadratic function the following solutions. Then describe what the discriminant would look like:

a) no real solutions



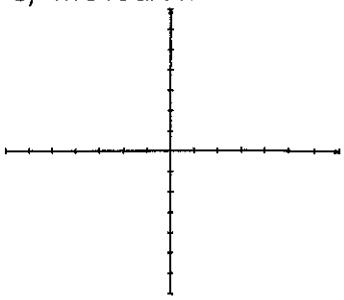
Discriminant: _____

b) one real solution



Discriminant: _____

c) two real solutions



Discriminant: _____

2. Find the discriminant for each equation, and then find the solutions.

a) $f(x) = 4x^2 + 4x + 1$

Discriminant: _____

Number of Solutions: _____

Solutions: _____

b) $0 = -2x^2 - 10x$

Discriminant: _____

Number of Solutions: _____

Solutions: _____

c) $8x^2 + 4x = 7$

Discriminant: _____

Number of Solutions: _____

Solutions: _____

d) $f(x) = x^2 - 8x - 23$

Discriminant: _____

Number of Solutions: _____

Solutions: _____

e) $f(x) = 3x^2 + 6x + 1$

Discriminant: _____

Number of Solutions: _____

Solutions: _____

f) $5x^2 - 10x = -5$

Discriminant: _____

Number of Solutions: _____

Solutions: _____

Solving by Quadratic Formula **Name:** _____

Extra Practice Assignment

Directions: Find the discriminant and tell the number of solutions. Then solve each of the following equations using the Quadratic Formula.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

1. $x^2 + 4x - 2 = 0$

Discriminant:
# of Solutions:
X =

2. $4x^2 - 8x + 3 = 0$

Discriminant:
# of Solutions:
X =

3. $5x^2 - 10x + 18 = 13$

Discriminant:
# of Solutions:
X =

4. $6x^2 = -4x - 10$

Discriminant:
# of Solutions:
X =

5. $2x^2 - 7x - 13 = -10$

Discriminant:
# of Solutions:
X =

6. $8x^2 + 4x + 16 = -x^2$

Discriminant:
# of Solutions:
X =

Error Analysis:
Describe and correct the error Jaya made when attempting to solve using the quadratic formula.

Problem: $7x + 2x^2 - 4 = 3$

Jaya's Process:

$7x + 2x^2 - 4 = 3$

$7x + 2x^2 - 7 = 0$

$$\frac{-2 \pm \sqrt{2^2 - 4(7)(-7)}}{2(7)}$$

$$\frac{-2 \pm \sqrt{200}}{14}$$

$$x = \frac{-2 \pm 10\sqrt{2}}{14}$$

$$x = \frac{-1 + 5\sqrt{2}}{7} \text{ and } \frac{-1 - 5\sqrt{2}}{7}$$

Correct Process:

Decision Making:

I have a non factorable trinomial where a is 1 and b is odd, which method am I going to use?

I have a factorable trinomial where a is NOT 1 and b is odd, which method am I going to use?

I have a non factorable trinomial where a is 1 and b is even, which method am I going to use?

I have a binomial squared and its equal to some number, which method am I going to use?

Solving Quadratic Equations – Matching Name:

Solve the following by: greatest common factor, factoring, square roots, or completing the square. Then, match the equation to the answer(s) on the right.

____ 1) $x^2 - 16x + 63 = 0$

____ 2) $x^2 + 6x - 2 = 0$

____ 3) $5x^2 = 45$

____ 4) $x^2 - 2x - 14 = -4$

____ 5) $4x^2 + 20x - 20 = 4$

____ 6) $(x+3)^2 + 2 = -10$

____ 7) $2x^2 - 3x = 0$

____ 8) $x^2 - 4x - 18 = -x$

____ 9) $x^2 + 14x - 30 = 8$

____ 10) $3x^2 - 2x = 8$

____ 11) $x^2 - 9 = 0$

____ 12) $5x^2 + 9 = 134$

____ 13) $x^2 - 8x + 3 = 0$

____ 14) $2x^2 + x - 10 = 0$

____ 15) $2(x-3)^2 - 12 = 4$

____ 16) $2x^2 + x - 10 = 5$

____ 17) $x^2 - 8x - 33 = 0$

____ 18) $x^2 - 4x - 12 = 0$

____ 19) $x^2 - 10x - 8 = 0$

____ 20) $2(x-3)^2 = 8$

one answer will be used twice

a) $x = 3, x = -3$

b) $x = -3 \pm \sqrt{11}$

c) $x = 2, x = -\frac{5}{2}$

d) no real solution

e) $x = 1 \pm \sqrt{11}$

f) $x = -2, x = 6$

g) $x = \pm 5$

h) $x = 7, x = 9$

i) $x = 0, x = \frac{3}{2}$

j) $x = 3 \pm 2\sqrt{2}$

k) $x = -3, x = 6$

l) $x = 4 \pm \sqrt{13}$

m) $x = 5 \pm \sqrt{33}$

n) $x = -3, x = 11$

o) $x = 1, x = 5$

p) $x = 2, x = -\frac{4}{3}$

q) $x = -7 \pm \sqrt{87}$

r) $x = -3, x = \frac{5}{2}$

s) $x = -6, x = 1$

Solving Review

1. **Solve** by Factoring:

$x^2 - x - 12 = 0$

2. **Solve** by Factoring:

$x^2 + 6x - 12 = 4$

3. **Solve** by Factoring:

$2x^2 - 11x + 30 = 15$

4. **Solve** by Factoring:

$7n^2 + 19n - 3 = -n$

5. **Solve** by Square Roots:

$-2(x + 1)^2 + 16 = 0$

6. **Solve** by Completing the Square:

$p^2 + 12p - 15 = 8$

7. **Solve** by Square Roots:

$4x^2 + 6 = 14$

8. **Solve** by Completing the Square:

$n^2 + 6n - 25 = 0$